TMF

March 1989

THE MAC FLYER - For Greater Safety in MAC Air Operations

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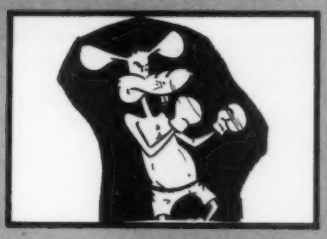
March 1989 MACSP 127-5 VOL XXXVI NO. 3



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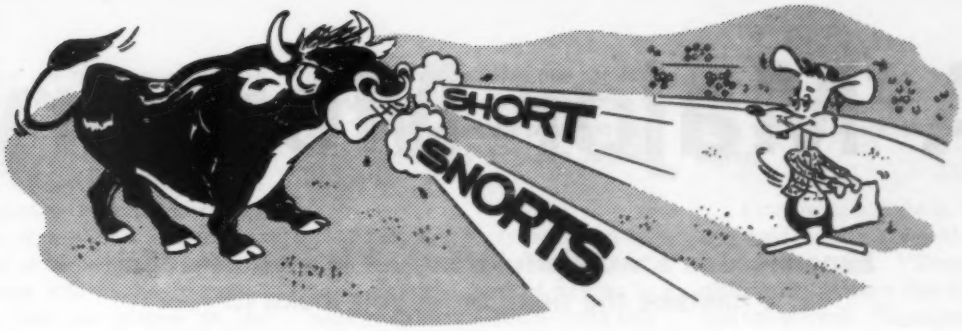


The first form of a Quickstopper was called Short Snorts. The artist was TSgt. Wayne F. Shannon. This logo ran from Nov 1966 to Jul 1970.

Short Snorts was replaced by Brainstorming, and ran for 10 months, from Jul 1970 to May 1971. Artist—TSgt. Wayne L. Mills.

HAPPY BIRTHDAY *TMF!!!*

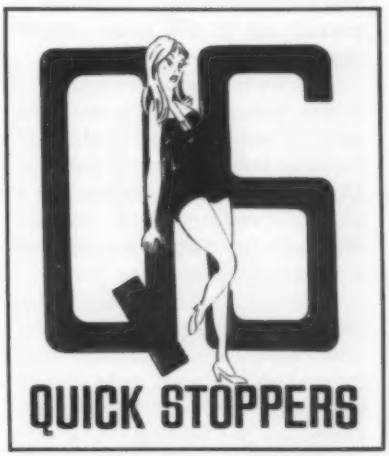
By Capt. Dan Dougherty
Associate Editor

This June will mark *The MAC Flyer's* 35th birthday. That makes the mag older than most of her command's aircrews, and we thought we'd help celebrate by doing some special things. So, beginning in this issue, we're going to reprint some of the finest stories that have graced *TMF's* pages the past three and one half decades.

We actually paged through and read a considerable number of 420 back issues. This tedious task was quite revealing, not only as a history of MAC, but also as a monument to an ongoing and steadily improving safety program throughout the years. Years ago, maintenance used to take some pretty serious hits and a preponderance of accident stories depicted maintenance as causal. But, you must readily admit, this isn't the case anymore.

In fact, logistics causes have been reduced to a minimum. As we're all aware, human factors are today's major mishap causes. The tone of the stories leads a reader through this transition; from maintenance to inadequate air traffic control; to an inexperienced crew force and combat losses; then heavy into pilot error; continuously developing to where we are today—human factors analysis.

What impressed us most throughout the years and the changes was our **Quickstoppers**. According to our readership surveys, Quickstoppers is our most popular and widely read feature. We were surprised to discover, however, that it is not as old as *TMF* itself and was conceived originally under a different title only 22 short years ago. But the most interesting tidbit of change that occurred throughout its 22-year life is the Quickstopper logo design. The logo actually mirrors societal attitude changes that came about during the same period.



Our first Fanny Flyer adorned our first Quickstopper. Again the artist was Sgt Mills, and this version lasted from Jun 1971 to Apr 1972.

Continued on page 6

CELEBRATING 35 YEARS OF *TMF*: 1954 - 1989

A Major Memory

Experience is a wonderful thing—it lets you recognize a mistake the next time you make it!

BY Lt. Col. James P. Bronowski
Chief, Safety Division
452 AREFW (AFRES)
March AFB, California

The weather is lousy. The ceiling is down to 200 ft with an RVR of 2400. Our KC-10 is loaded with 320,000 pounds of fuel destined for two C-5s, so we're maxed out in the gross weight department.

As we're cleared for takeoff, I watch, from my perch in the right seat, our young aircraft commander confidently put our Douglas Racer into motion. It's a chair I've occupied as an instructor for many years, and feel it's the best seat in the house.

"Set takeoff power, autothrottles on," he said, with the quiet assurance of someone who knows he's in charge, as he pushes the three throttles toward the computed N-1 setting.

The engineer leans forward, his eyes watching spinning dials and flopping counters as he fine-tunes the gigantic power plants. My concentration goes from engine instruments to outside, and down to the airspeed indicator.

"Eighty knots," I report as my crosscheck picks up the now-illuminated CLAMP light. Everything is fine so far as I wait for my next task, which is to call out V_1 at the appropriate airspeed. It seems to take forever to get to that decision speed as my eyes continue their circuitous route, covering all those inside and outside indicators so conducive to my longevity in the air.

"Positive rate, gear up," my fellow pilot commands from his seat of authority. Just as I move the handle upwards, three things happen—none of them good. First, we enter the weather. Second, the Number 1 engine fire light illuminates, along with the master fire light and the fire alarm's "fingernails on the blackboard" sound. Third, the engine instruments connected to the vital signs of engine Number 1 roll back, indicating its rapid and violent demise. My eyes catch the EGT gauge, which has decided not to join his fellow indicators, but rather stay at his post and send his high-temperature message until the bitter end.

Even though we are in the simulator, I expect the AC to calmly fly the aircraft, execute the proper emergency procedures, and coordinate safe recovery procedures with the crew and ATC. My expectations are dashed, however, as his preoccupation with lights, horns, and procedures cause him to temporarily ignore the fact that the uncorrected yaw induced by the loss and seizure of Number 1 engine has started our little group towards our simulated smoking hole.

As the electronically enhanced green grass of home comes speeding towards us, my colleague, in a vain effort to rectify the error of his ways, is frantically throwing controls from stop to stop. However, our fate has already been decided by a microchip in a fan-cooled cabinet that has memorized all the rules of aerodynamics, including in flight minimum control speed.

Suddenly all those hydraulic actuators making this contraption look like a spider caught in molasses, freeze—leaving the box on top of its mechanical legs, sitting askew and silent. Inside, there is silence for a moment as the occupants scramble for approach plates and pencils that have obeyed Newton's Third Law of Motion.

1988 MAC Flight Safety Writing Contest Honorable Mention

There are no firemen risking their lives to enter a burning aircraft, no flooding the base with calls as word of a major aircraft mishap leaks out, and no ashen-faced squadron commander sitting in front of a phone to relay his message of sorrow to the next of kin. There will be no memorial service, and no plaque at the flagpole. Only the whir of machinery, hydraulic actuators, and air conditioners break the silence; not, fortunately, the wail of sirens or shouts of men engaged in futile rescue attempts. There will be no mishap board pouring over the smallest details for months and months until the mishap can be recreated, step by step, so others may learn and avoid the same disaster. No, we will reset the simulator and give our airmen something our aircraft would never consider—*a second chance.*

I look at the captain as he prepares himself for another opportunity to save those who entrust their lives to him, and my mind drifts back 20 years to the EC-121 (Super Constellation) simulator building. I'm a second lieutenant, I'm at attention and I'm scared. My aircraft commander, a major who seems to be the oldest person in the world, is shaking his finger at me and letting me have it with both barrels. His ruddy complexion is now a deep purple as he rips into me, "Don't you ever let me forget the landing gear again! Do you understand me? Never again!"

With my self-esteem completely devastated, and in my earnest desire to get back into his good graces, I counter with a stupid statement: "It's just the simulator," I say, mustering what self-respect I have left.

"Just the simulator!" he roars. "The simulator and the aircraft are the same thing. The mistakes you make in one are the mistakes you'll make in the other. Don't you ever let me hear you say that again. Do I make myself clear?"

"Yes, sir," I say, knowing for sure I should have gone into civil engineering instead of having to submit to verbal abuse from this red-headed tyrant.

Time heals all wounds however, and, in the ten thousand or so times since that I've lowered the landing gear, or called to have it lowered, the memory chip of that major whom I feared so greatly is still there. Everytime I step into the simulator, there's the faintest fear he'll be waiting outside to chastise me for any mistake I make—a mistake that could have caused a mishap. I wish now I could thank him. I wish he could know how that single chewing out gave me the proper perspective for simulator training and may have, somewhere along the line, saved my life.

My mind snapped back to the real world as the AC started pushing the throttles forward and the takeoff litany began again. I knew what I had to do. I grabbed all three throttles and shoved them to idle with a loud thud. This brought immediate silence and attention from our enclosed group.

"Do you know what you just did?" I asked the AC in a tone of voice that told all present there was an uncomfortable situation brewing.

"No sir," he said with a perplexed look of concern and caution.

"You just crashed this airplane and killed everyone on board," I said as I leaned over the throttle quadrant to get a little less space between his eyes and mine.

"But sir, this is just a simulator and no one got hurt," he said with a voice beginning to waiver.

I looked him right in the eyes and said with a voice that even frightened me, "There's no difference between the simulator and the aircraft. The mistakes you make in here are the mistakes you'll make in the aircraft. If this incident had happened in the airplane, you and the crew would be dead. Treat the simulator with the same respect and caution you exhibit in the aircraft. Do I make myself understood, Captain?"

"Yes sir," he answered quietly.

Now assured the lesson had been learned, I turned my head and gazed out the right window at a television image of a square-cornered taxiway, closed my eyes and said in silence: "Thanks, Major." ✈

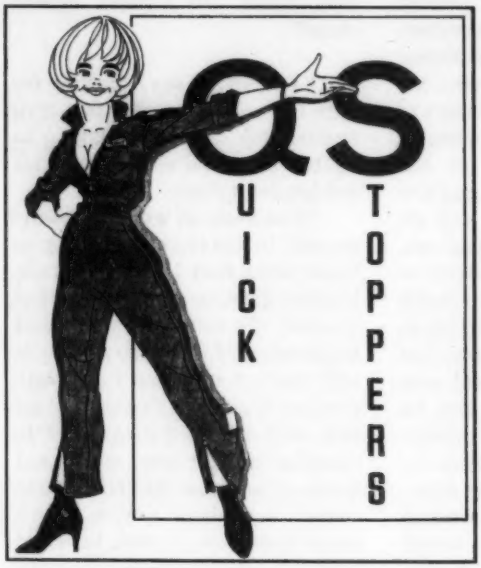
Lt. Col. James P. Bronowski graduated from the University of Nebraska at Omaha in 1964. After UPT at Vance AFB, Okla, Colonel Bronowski flew EC-121s at McClellan AFB, Calif. Following a subsequent tour in Vietnam, Colonel Bronowski flew EC-135s for the next 12 years at Loring, Castle, Grissom, and March AFBs. He entered the Reserves during his assignment at Grissom. In 1983, Colonel Bronowski transitioned to KC-10s and became commander, 70 AREFS (Associate). He is a command pilot with over 6,300 flying hours, 1,525 of which were logged in combat.

QUICKSTOPPERS

Today's logo.

Throughout this month's issue, we've scattered some of the best Quickstoppers printed in the last 22 years. We plan to add at least one page of these timeless short stories throughout this year so you too may recognize and enjoy not only the never-ending humor that graces our chosen profession as military aircrew, but also the fact that we continue to fill our ranks with the human race—a group that continues to repeat similar mistakes, bounce back, learn lessons, and then make 'em again.

Welcome to the historical world of the Quickstopper! Please sit back, relax, learn, and enjoy!



The second Fanny Flyer was also drawn by Sergeant Mills, and lasted until his replacement arrived in May 1974.

The artist was TSgt. Eugene Reese, and this version of Fanny lasted until Jul 1976. Our fourth version began to show signs of a major societal shift—note the zipper's up.

Brian L. Gauss began drawing the logo in Jul 1976; notice the curves have been toned down. This version lasted until Brian left us in Oct 1979, and our current artist, Tommy O'Laughlin, came aboard.

The final version. Tommy actually drew a different version monthly, but Fanny met an untimely demise (or got the ax, so to speak) in Feb 1983 when formal discrimination charges were lodged against us. While perusing all of our past illustrations, we were quite honestly surprised she lasted that long.

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CELEBRATING 35 YEARS OF *TMF*: 1954 - 1989

Anatomy of a Landing

—Cue by Cue

By Mr. Howard Hasbrook

Visual cues—you may not even be conscious of them—are what guide you to a touchdown, and they can be deceptive if you don't know how to read them.

(Editor's Comments: The following article is adapted from the FAA Accident Prevention Program for General Aviation. The concepts and landing techniques described, however, can easily be applied to landing any type aircraft. The information presented might seem a bit elementary to some "high time" pilots, who have thousands of landings in their log books. The analysis, however, will reacquaint any pilot with the basics of a good visual approach and landing. A "back to basics" approach may well be in order now, considering that poorly controlled approaches and hard landings have recently resulted in several costly mishaps.)

There's an old saying, "A good landing requires a good approach and, conversely, a poor approach leads to a poor landing." Basically, these are correct. The approach is the primary key to putting the airplane on the ground where the pilot wants it, at the right speed, and in the proper attitude.

What is the secret of making a good approach? It's keeping on a constant-angle descent, the flight path lined up with centerline, and intersecting the runway near the desired touchdown point. That path also must be of sufficient length to give the pilot enough time to make necessary corrections to "get it in the groove" before it's time to recheck gear-down-and-locked and flare.

Keeping an airplane on a straight flight path to the runway requires control of several variables. These include aircraft speed (horizontal and vertical) and heading (the latter usually complicated by crosswind). The need for speed control can't be overemphasized. It's absolutely essential, not only from the point of view of making precise landing approaches, but also in relation to providing adequate aircraft performance and control during routine and emergency situations.

More approaches—and subsequent landings—are messed up by poor airspeed control than by any other factor. This is because airspeed changes affect lift, ground speed, vertical speed, flight path profile, flight path angle, and subsequent touchdown point. *Airspeed changes usually occur because the pilot fails to maintain a constant pitch angle for a given thrust condition.* Such pitch changes, regardless of whether they're pilot-induced or produced by rough air, cause lift and vertical speed changes, resulting in an undulating flight path.

Although most pilots are not consciously aware of these cues, the decreasing distance between the top of the runway and the horizon, the uniform visual widening and lengthening of the runway triangle, the straightness of the runway image—or its lean—and the speed and direction of flow of intervening terrain toward and past the pilot (as seen in his peripheral vision) are all used to evaluate approach progress. This evaluation capability can become extraordinarily efficient through practice, so long as the pilot knows what to look for. For example, he can, through psychological reinforcement during daytime approaches, come to associate decreasing altitude with the illusion of increasing ground speed seen through the sides of his eyes. As terrain flows past the aircraft, the more rapid the apparent flow, the lower he expects his altitude to be. Conversely, a decrease in apparent flow speed means a higher altitude.

Thus, during an approach into a strong headwind, a pilot may inadvertently descend below proper glide path because of the impression he is too high. (The reverse of this visual illusion can occur during a downwind turn at low altitude. This has caused pilots to pull up—and stall—because the apparent increase in ground speed gave them the impression they were losing altitude.)

Constant widening of the runway's outline, as a function of the aircraft getting closer to the runway, is another important cue to assess the correctness

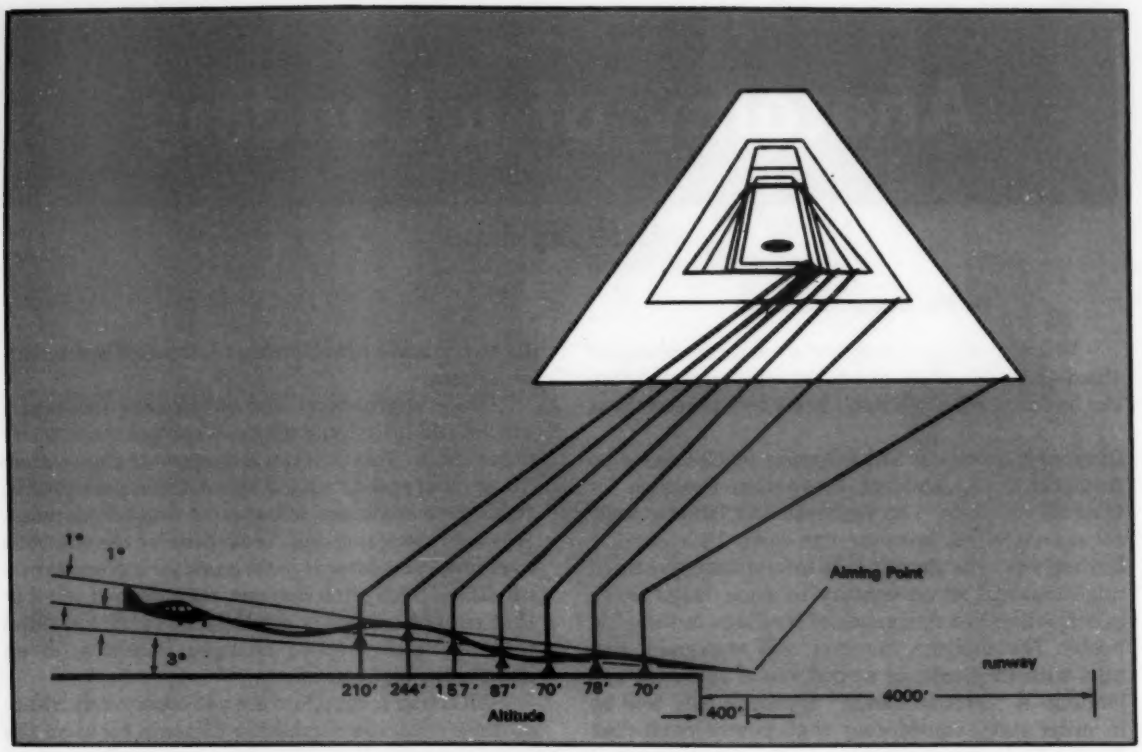


Figure 1

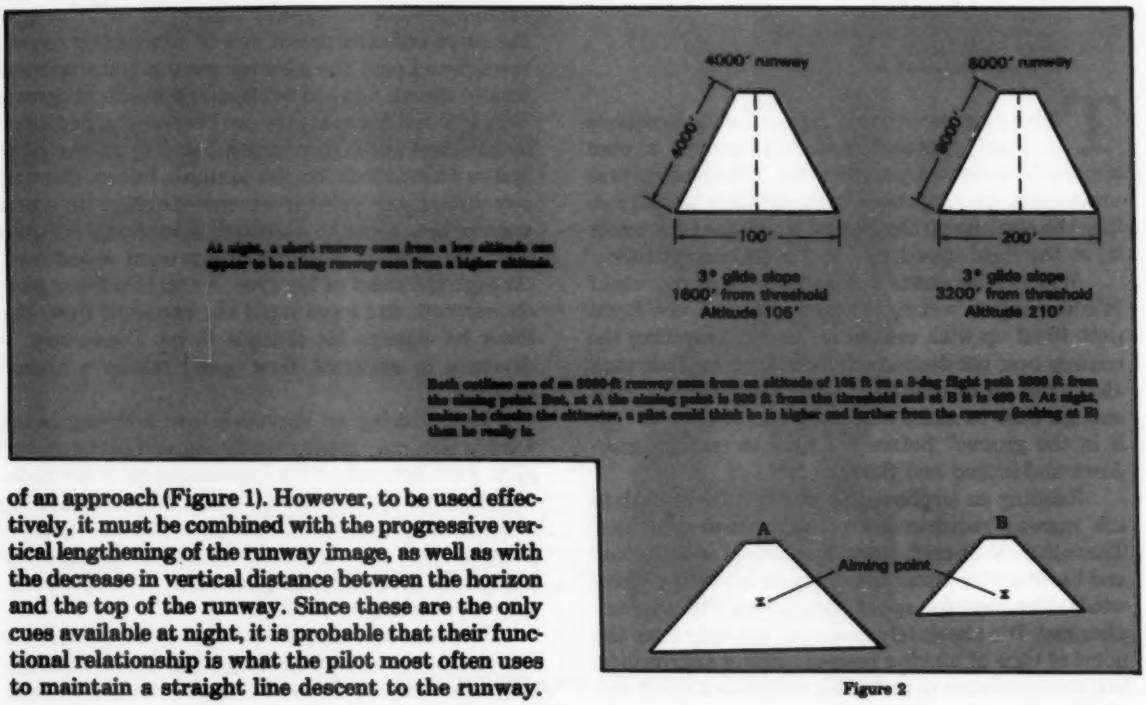


Figure 2

of an approach (Figure 1). However, to be used effectively, it must be combined with the progressive vertical lengthening of the runway image, as well as with the decrease in vertical distance between the horizon and the top of the runway. Since these are the only cues available at night, it is probable that their functional relationship is what the pilot most often uses to maintain a straight line descent to the runway.

Unfortunately, not all runways are the same length and width—varying in length from 1,500 to 15,000 ft, and in width from 50 to 300 feet. Since there are many possible combinations of width to length, it's apparent the use of runway outline cues is not a simple task. For this reason, pilots should be very cautious and alert when making an approach to an unfamiliar airport—particularly at night (Figure 2).

Expansion theory relates to the apparent outward movement of terrain from the point where the flight path intercepts the runway. The no-vertical-motion area is used in the same way to determine the intersection point. Everything above this area appears to move toward the horizon, everything below it toward the aircraft or obliquely downward. The consecutively larger trapezoids (Figure 3) illustrate the appearance of the runway as it grows uniformly larger during an ideal approach path. The runway appearance from consecutive points on an actual oscillatory flight path is illustrated in Figure 1.

As noted before, with constancy of airspeed, pitch attitude, and thrust (and of wind)—the flight path, and its angle, remain constant. This, in turn, will also result in a constant rate of change in the angular and dimensional relationship of the runway image. This constancy, as well as that of increase in apparent ground speed, are valuable visual cues.

Another problem some pilots encounter is visualizing proper flight path angle to the intended touchdown point. On many occasions, we've seen private and commercial pilots start their descents so far from the airport that the flight path (if continued at the same angle) would have intercepted the ground a mile or more short of the runway.

When approaches are made from two or three miles out, an error of only a few degrees in flight path angle will result in large under/overshoots. As illustrated in Figure 4, if the approach path is begun at about 525 ft above airport level at a distance of 10,000 ft from the runway, a 2-degree flight path, if continued without correction, would put the touchdown point almost one-half mile beyond the far end of the runway. On the other hand, a 4-degree flight path angle would put the aircraft into the ground one-half mile short of the runway unless correction was made soon enough. Incidentally, at night the surrounding terrain cues showing need for such a correction are often quite meager and almost undetectable—which could account for the rather large incidence of VFR night landing approach accidents where aircraft hit short of the runway.

Thus, it's obvious the pilot must be able to determine his flight path to the desired spot without having to make corrections later on in the approach. Some pilots say they use a spot on the windshield as a form of gunsight to initiate—and then hold—a constant flight path angle. However, if one examines

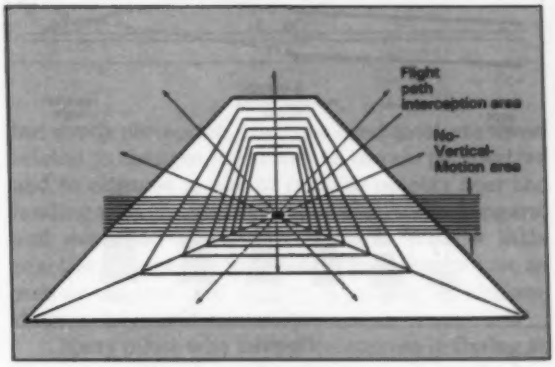


Figure 3

this technique in detail, some of its problems become readily apparent. For example, unless you're operating in extremely smooth air, aircraft pitch angle will normally vary a few degrees with normal pilot handling. At a 30-inch distance (windshield spot to pilot's eye) only a 2-degree change in aircraft pitch will involve about a one-half inch movement of the spot; a movement most difficult to nail down against the runway in any kind of turbulence—which exists almost constantly near the ground on warm or windy days. In addition, vertical movement of the pilot's head and eyes add error to this method. Thus, using a windshield spot as an aiming device can easily cause the pilot to overshoot or undershoot, since a 1-degree error can put him half a mile or more on either side of his intended landing spot.

In choosing an approach angle best suited to ordinary conditions, keep in mind that the glide paths of most VASIs and ILSs are set at 2 ½ to 3 degrees. Approaches made at these angles with conventional,

A 3-deg approach initiated at about 525 ft above airport elevation 2 m out should put the touchdown within the first 20 percent of the runway. A 1-deg error, if uncorrected, will result in an under- or overshoot of about ½ mi relative to a 2500 ft runway. If a corrective maximum descent is initiated above the threshold (A), almost half the runway will be overflown before touchdow. An 8-deg descent started at (B) would permit use of the whole runway.

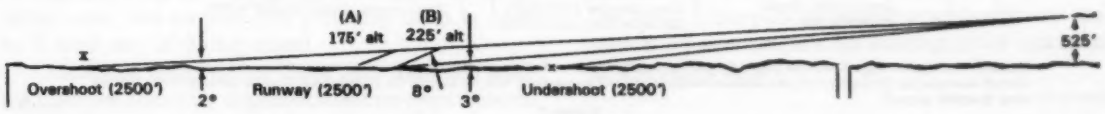


Figure 4

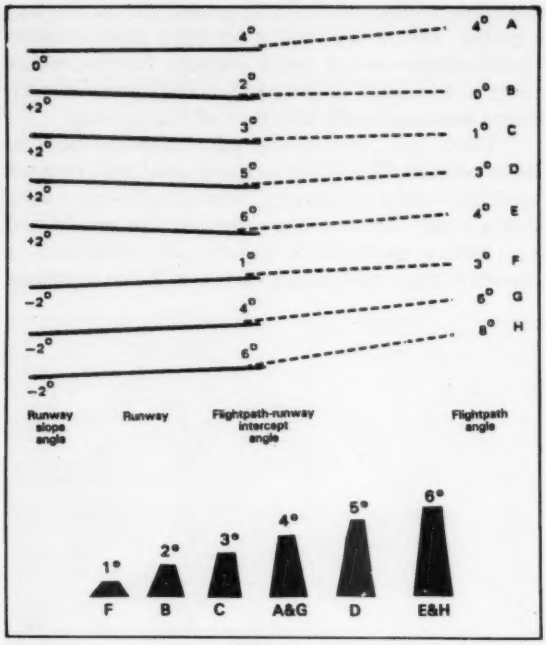


Figure 5

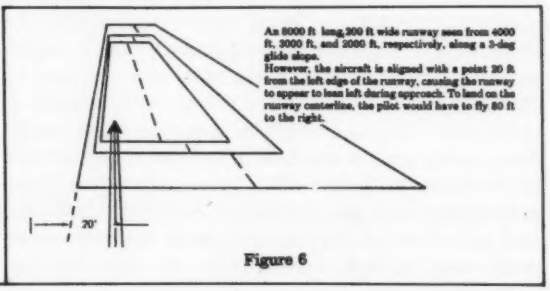
fixed-wing aircraft result in airspeed and vertical speed envelopes that provide adequate control, reasonable landing gear loads at touchdown, and safe rollout distances. Therefore, unless you're contemplating operating into very short strips over high obstructions, it would seem desirable to routinely use 3-degree flight path angles during visual approaches to develop constant visual reinforcement. However, remember that all runways are not necessarily level. (Figure 5).

Another factor that can sabotage the best approaches and landings is crosswind. Crosswind is a fact of life most of the time, regardless of how many runways are available. During an approach, it can be handled by using one or a combination of several methods. One method, of course, is to set in the required crab angle. The difficulty with this type of wind correction is that variations in wind, as altitude diminishes, require constant changes in heading. And changes in heading take appreciable time—time which may not be available.

Another method is to use sufficient slip (toward the windward side) to compensate for crosswind drift. This requires less time for heading changes but requires a fairly high degree of proficiency in cross-control. Many pilots favor this technique because it keeps the airplane's longitudinal axis (centerline) lined up with the runway, and requires no last second de-crab maneuver just before touchdown. (The slip method also saves tires and helps keep the windward wing down.)

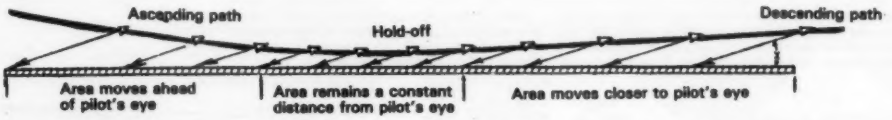
However, regardless of which method you use—and sometimes, in conditions of heavy crosswind you must use a combination of both —the amount of drift correction required can be easily detected by visually noting whether the aircraft is aligned with the theoretical extended runway centerline. A visual cue to detect alignment relates to whether the runway image leans (Figure 6) to either side of vertical. If the runway leans, approach path is not in line with the center of the runway—and, sooner or later, you'll have to make an "S" turn.

Visually determining where the flight path intersects the runway can be difficult unless one knows where and what to look for. Some instructors refer to it as the center of the expansion pattern—an area of no movement, around which all portions of the terrain and runway expand or move outward (Figure 3). In our study, the interception point seems to lie in an area above which the runway seems to move vertically toward the horizon and below which it expands toward the approaching aircraft. Essentially, it's an area of the runway that has no apparent vertical motion. Once a pilot has become consciously aware of this visual cue and can use it with some degree of accuracy, the chance of over/undershooting decreases.



An 8000 ft. long,200 ft wide runway seen from 4000 ft, 3000 ft, and 2000 ft, respectively, along a 3-deg glide slope.
However, the aircraft is aligned with a point 20 ft from the left edge of the runway, causing the runway to appear to lean left during approach. To land on the runway centerline, the pilot would have to fly 80 ft to the right.

Figure 6


Ascending path
Hold-off
Descending path
Area moves ahead of pilot's eye
Area remains a constant distance from pilot's eye
Area moves closer to pilot's eye

Constant interception angle X between pilot's central vision and runway surface causes distance between interception area and eyes to diminish as the aircraft descends (A). During hold-off, the distance remains equal and moves along with the aircraft (B). If flight path ascends, the area moves forward away from the aircraft.

Figure 7

However, for those who have difficulty in seeing this no-movement area, they can use the old time-honored technique of noting whether the runway threshold rises or lowers with respect to the aircraft's nose to obtain a rough estimate of whether you're under or over shooting. This procedure, of course, requires a constant pitch attitude as well as a constant (fixed) location of the pilot's eyes in relation to whatever portion of the airplane he may be using as a reference point. For example, stretching upward to see over the nose can change the pilot's vertical viewing angle by several degrees, comparable to the visual effect of changing the aircraft's pitch attitude by a like number of degrees.

During poor visibility conditions, and particularly during night approaches, a pilot can crosscheck his glide path with the altimeter and vertical velocity indicator. He should set his own VFR minimums relative to airport elevation, making sure he doesn't hit the 50-ft mark until he's over the runway threshold. Also, using a descent rate not in excess of 400 to 500 fpm helps prevent an inadvertently steep flight path. Even on clear (but moonless) nights, an approach into a "black hole" airport out in the boondocks can be extremely hazardous unless the flight instruments are scanned systematically until reaching the runway—simply because of the visual illusions involved.

Flaring the airplane is not difficult if the pilot knows where the ground is. If he doesn't, he's in trouble.

Flare cues are primarily dependent on the angle at which the pilot's central vision intersects the ground (or runway) ahead and slightly to the side (Figure 7). Unfortunately, the why of this intercept angle is not very well understood. However, if a pilot only looks at the far end of the runway during his intended flare, he may not flare at all. This is probably because, for example, a vertical distance of 10 ft between his eyes and the ground only subtends an angle of one eighth of a degree, measured at the end of a 5,000 ft runway, and his eye has difficulty resolving (seeing) changes in such a small angle. To detect a left variation in vertical distance between his wheels and the runway requires detection of one-eightieth of a degree change in angle—an impossible task!

On the other hand, if the pilot looks at the runway at a point too close to his plane, he'll see nothing but a blur of passing runway surface, or he'll have the illusion that he's lower than he actually is. In either case, the aircraft will probably drop in hard as it runs out of flying speed.

Although many pilots think that flare and landing cues are primarily dependent on two-eyed (binocular) depth perception, the cues used most are those related to changes in runway or terrain perspective and to changes in size of familiar objects near the landing area, such as fences, bushes, trees, hangars, and even sod or runway texture. With a little practice, monocular (one-eyed) vision works just as well as the two-eyed variety in putting an airplane down safely—and smoothly.

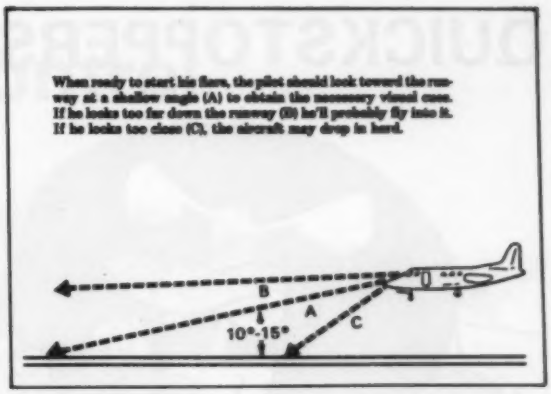

When ready to start his flare, the pilot should look toward the runway at a shallow angle (A) to obtain the necessary visual cues.
If he looks too far down the runway (B) he'll probably fly into it.
If he looks too close (C), the aircraft may drop in hard.
B
A
C
10°-15°

Figure 8

Many pilots who have good success in flaring at the proper altitude, and maintaining their wheels a few inches above the runway until eventual touchdown, do so by directing their central vision at a shallow downward angle of from 10 to 15 degrees towards the runway. As shown in Figure 8, maintaining the same viewing angle causes the point of visual interception with the runway to move progressively rearward toward the pilot as the airplane loses altitude; this rate of rearward movement may be an important cue in assessing rate of altitude loss. Conversely, forward movement of the visual interception point will indicate an increase in altitude, and would be interpreted to mean the pilot had increased the aircraft's pitch angle too rapidly, resulting in an overflare.

Finding this visual intercept point in conjunction with assessment of the low velocity of nearby off-runway terrain, as well as the similarity of appearance of height above the runway ahead of the aircraft (in comparison to the way it looked when the aircraft was taxied prior to takeoff) may also be used to judge when the wheels are just a few inches above the runway.

To recap—consistently good landings require constant flight path angle and airspeed. To attain consistency, keep alert to visual cues necessary to the task . . . if a pilot is having trouble with his landings, it's a sure bet he's not looking in the right place at the right time.

Adapted from *FAA-P-8740-26*

QUICKSTOPPERS

HOW'S THAT AGAIN?

Our First Quickstopper
(November 1966)

The Tactical Air Command reported one of their planes, in flight, *was hit by a mouse*. The plane, piloted by Capt. Robert W. Carter of the 346th Troop Carrier Squadron, suffered no apparent damage.

Carter had to fill out a report on the accident. His report read: "While approximately 1,000 ft in the air on approach to Rhein Main AB, Germany, the crew observed an eagle approaching for a head-on collision. The bird was carrying a mouse.

"The aircraft could not be veered since it was in a controlled final approach. Just prior to an inevitable midair collision with the eagle, the bird pulled up and released the mouse directly into the No. 2 engine."

Carter had one problem. The Air Force doesn't have a "Mouse Strike Form." So he used a Bird Strike Form and made the appropriate substitution.

DEUTERONOMIC DECLAMATION

(December 1971)

Recently, officials at London Airport had to refer to the Bible to decode a reply from a Royal Air Force pilot inbound from Gander. He had just been ordered to divert his VC-10 airliner to Keflavik to pick up some equipment. The pilot answered the order with this message: "Deuteronomy, Chapter 27, Verse 18."

Officials checked and found that the verse read: "Cursed be he that maketh the blind to wander out of the way. And all the people shall say, Amen."

Have any of you had the same thoughts immediately following a diversion?

THE YOLK'S ON ME!

(June 1983)

The C-130 had just lifted off from sunny Florida bound for the snowy wastelands of the North. After an uneventful level off at FL 250, the crew busied themselves checking out the always excellent inflight lunches prepared by the departure station's inflight kitchen. The copilot inspected his hard boiled egg, then tapped it on the throttle quadrant. As he did, he felt a thick fluid oozing through his fingers. Since another crewmember did a great chicken imitation, there was no doubt as to the origin of the obviously never-boiled egg.

After a thorough investigation and cleanup, the blame was placed with the inflight kitchen. No harm done, but the potential was there. Good thing the copilot didn't order the chicken snack!

CELEBRATING 35 YEARS OF *TMF*: 1954 - 1989

Continued on page 20

A Matter of Control

Providence favors preparedness.

Brad "Mac" MacKenzie moved smartly down the aircrew ladder and walked towards the maintenance hangars. Almost in marching cadence, his measured stride was unbroken as he returned the guard's salute and quickly slipped his line badge into his leather flight jacket pocket.

A safe distance from "the sounds of freedom," Mac removed his earplugs and passed through the hydraulics shop on his way to the flight safety meeting. There were still 45 minutes until the meeting would begin, so he had plenty of time to rehearse and reflect again on this month's topic: *Flight Control Malfunctions.*

Perhaps he should begin his presentation with a rhetorical question such as, "Fellow crewmembers, what would you consider the most critical aircraft system on our C-141 Starlifters?" If deafening silence doesn't follow

"Mac, I . . . we've got a problem here. Can't get the wings level!"

such an opening, he might anticipate responses such as "powerplant" or "environmentals" or "electricals." Some wiseguy is bound to pipe up and get a laugh with "crew latrine" or "coffee pot." But, considering which system physically links the pilot to aircraft flight control surfaces, the answer should be quite obvious "even to the most casual observer."

Mac ponders the awesome impact of flight control malfunctions aboard large aircraft. Bailout isn't a viable option, as it would be in fighters or trainers. Today's heavy transports (and helos) rely on hydraulic servos to move massive flight control surfaces against forces generated by high speed airloads. No man or beast possesses the brute strength required to overpower those hydraulic servos. The sole alternative is to resolve flight control difficulties by using backup systems and/or aircrew ingenuity. A shudder passes through his body whenever he recalls his own "close encounter" with a flight control emergency.

★ ★ ★

Mac was copilot on that mission several years ago. The AC had smoothly accelerated the Starlifter to V_1 when Mac said "Go." As the left seater rotated for takeoff, the aircraft suddenly began an uncommanded right roll which couldn't be countered by aileron or rudder inputs. Mac instinctively raised the gear handle as his AC grunted, "Mac, I . . . we've got a problem here. Can't get the wings level!"

Mac reached for the control yoke and confirmed it was twisted full-left against the stops. He noted the turn-slip indicator showed "ball right," since full left rudder was also being applied with all the strength the AC could exert. Mac squeezed the mic switch and alerted tower to their situation just as the big air machine suddenly rolled left. They were still close to the ground (with obstacles ahead) so, with his free left hand, Mac pushed the throttles to full takeoff power to help raise the nose. Dramatic oscillations continued as they passed 1,500 ft with the AC desperately attempting to counter each rolling motion with aileron and rudder inputs.

Extreme bank attitudes subsided for a few minutes so they reached for more "life-saving altitude" and continued to 10,000 ft before attempting a controllability check.

The passengers, unfortunately, were made fully aware of the gravity of the emergency when a retired flight engineer in the back shared his aircraft systems insight with them. The loadmasters reassured them the crew was getting the situation under control.

After visually confirming spoiler panels and flaps were properly positioned, and with the situation stabilized, the crew could

detect no wing or flight control surface abnormalities. Radio calls to tower eliminated the possibility that wake turbulence or wind shear had caused the upset during departure.

Controllability checks were then carefully coordinated with scanners prior to any flight control inputs. All controls seemed to respond normally. However, the mysterious loss of flight control authority during takeoff was unsettling and a hasty return to land seemed too risky.

Suddenly, the abrupt oscillations resumed and the pilots again fought desperately to regain control. With a note of determination in his voice, the AC exclaimed, *"This is not going to be our day to die!"* Though a sense of helplessness and fear was affecting every aircrew task, none could afford to reveal his emotions. Confused and frustrated by their apparently helpless situation, Mac found calm in a brief, silent prayer: "Dear Lord, I'm scared. Please help us find a way to get through this predicament."

Still in a 45-degree bank, the AC carefully rechecked every switch and cockpit instrument. Pointing to the turn/slip indicator, he noted the ball was fully deflected opposite his rudder pedal input. Verbally analyzing this apparent abnormality, he suggested that adverse rudder trim might be the cause of their difficulties. The pilots quickly discarded that fleeting notion, more carefully considering what would happen if they "centered the ball." The "full opposite" rudder deflection was the only thing keeping them right-side-up!

Consulting with stan-eval through the wing command post, they were advised to test controllability with ailerons depowered and in the "tab operable" mode. Following careful procedural review among crewmembers, the proper switches were identified.

The instant the left aileron tab was unlocked, the aircraft suddenly resumed the strange and uncontrollable rolling motions. The left aileron switches were immediately restored to the "normal" position, but sporadic gyrations and steep bank angles continued. Both pilots turned the yoke and applied full rudder into the high wing. The aircraft was still uncontrollable.

The flight manual didn't address uncommanded aileron inputs. Although activation of the manual backup "tab operable"

"Dear Lord, I'm scared. Please help us find a way to get through this predicament."

system didn't immediately alleviate the spastic aileron inputs, the crew again pursued depowered ailerons as a possible solution. It was time to improvise, so they positioned all four aileron control switches to "tab operable" simultaneously.

A state of relative calm ensued. Although they only had limited aileron control authority in this mode, the dramatic oscillations didn't return. Mercifully, after an hour of semi-controllable flight, the sporadic gyrations subsided long enough to permit an approach and landing with all ailerons fully depowered.

Safely on the ground, Mac had tested his voice again with, "That was quite an airplane ride we just took, friend." The AC quietly replied with, "Yeah, and we were just passengers for a major portion of it!"

Following safety investigation, depot trials of the aileron power packs (hydraulic servos) proved that a right servo occasionally responded with spastic shuddering. Teardown inspection revealed a defective seal inside the servo assembly.

Later reflection by the crew produced further insights: During the emergency they had reviewed the "tab-operable" procedures in the checklist, which instructed them to have scanners carefully verify which aileron was malfunctioning. That step proved impossible to comply with since the pilots had to continuously move the ailerons to maintain aircraft control. With their extreme bank angles, neither aileron was clearly identified as malfunctioning. With a fifty-fifty shot at selecting the correct one for "tab-operable" mode, they chose the left one. (Overlooked was a corallary to Murphy's Law: "The chance of a piece of bread falling with the buttered side down is directly proportional to the cost of the carpet.") Naturally, with only the "good" left aileron depowered, the spastic right ailerons could generate the severe gyrations, unopposed by ineffective yoke inputs from the pilots.

★ ★ ★

The appointed time for the safety meeting was now only 5 minutes away. Well, thought Mac, enough reminiscing about past hydraulic flight control systems difficulties. Now to address the real flight safety message of that story: Systems knowledge, no matter how tedious, trivial, or boring it might seem when we first endeavor to acquire it, it can save your life! Know the details. Mentally rehearse what you'll do in a given emergency, and how you'll respond to sorting out those situations which aren't even covered by the book! Be prepared for the situation that "just can't happen to me." ✈

1988 MAC Safety A

MAC Flight Safety Achievement Award

(Colocated units share in the award.)

Category I

1 SOW
39 SOW
41 RWRW
60 MAW & 349 MAW (Assoc)
63 MAW & 445 MAW (Assoc)
89 MAW
314 TAW
374 TAW
375 AAW & 932 AAG (Assoc)
435 TAW
436 MAW & 512 MAW (Assoc)
437 MAW & 315 MAW (Assoc)
438 MAW & 514 MAW (Assoc)
443 MAW
463 TAW
1550 CCTW

Category II

1 SOS
7 SOS
10 MAS
21 SOS
53 WRS
56 ARRS
58 MAS
67 SOS
316 TAG
616 MAG
1400 MAS
1402 MAS

Category III

Det 1, 1400 MAS
Det 2, 1400 MAS
Det 1, 1402 MAS

MAC Distinguished Flight Unit Safety Award

Category I	Category II	Category III
437 MAW	616 MAG	Det 1, 1402 MAS

MAC TROPHY FOR FLIGHT SAFETY

21 AF	22 AF	23 AF

MAC Ground Safety Achievement Award

(Colocated units share in the award.)

Category I

39 SOW
41 RWRW
314 TAW
374 TAW
375 AAW
436 MAW
443 MAW
463 TAW
1550 CCTW
Malcolm Grow USAF Medical Center

Category II

7 SOS
8 SOS
16 SOS
20 SOS
53 WS
316 TAG
608 MAG
834 CRS
834 SP
834 TRNSPS
834 SUPS
834 AGS
834 EMS
1365 AVS
1400 MAS

Category III

Det 1, 1363 AVS
Det 1, 1400 MAS
Det 1, 1402 MAS

Awards Winners

The Lamar F. Renfro Award for Ground Safety

Category I	Category II	Category III
443 MAW	316 TAG	Det 1, 1402 MAS

The Commander in Chief's Trophy for Ground Safety

23 AF

MAC Services/Airlift Divisions Ground Safety Trophy

AWS	322 ALD	834 ALD

MAC Support Safety Achievement Award

2 MAPS	8 MAPS	605 MASS	611 MASG	619 MASS

MAC Explosives Safety Award

1 SOW	314 TAW	608 APS

MAC Safety Officer of the Year Awards

Primary Duty

Capt. Danny P. Radcliff
322 ALD

Additional Duty

Maj. Jack R. Exon
608 MAG

MAC Safety NCO of the Year Awards

Primary Duty

TSgt. Scott M. Davis
322 ALD

Additional Duty

TSgt. David W. Foster
374 APS

Flying-Hour Milestones

15,000

165 TAG
SMSgt. Keneth E. Walters

312 MAS
MSgt. Earl T. Crabtree

10,000

9 SOS
CMSgt. Leroy A. Hoffman

133 TAW
CMSgt. Gerald E. Gould
MSgt. Loren G. Stahmer, Jr.

165 TAG
CMSgt. Robert E. Hutcherson
CMSgt. Richard O. Morin
SMSgt. Charles Henderson
SMSgt. Walter F. Morgan
MSgt. Claude S. Wright

702 MAS
SMSgt. Robert A. Accosta

7,500

6 MAS
Maj. David N. Cliff
CMSgt. Cleveland Croswell

30 MAS
SMSgt. Robert C. Bloom
MSgt. Berry L. Watts

57 MAS
SMSgt. Bruce F. Hinman, Jr.
MSgt. David G. Brignola

133 TAW
MSgt. Elmer Born

153 TAG
SMSgt. Robert L. Harrington
MSgt. Erwin L. Warden

165 TAG
Col. Ronald E. Blackmore
Col. William P. Bland, Jr.
Lt. Col. James S. Williams
SMSgt. Raymond L. Smith
MSgt. Eugene V. Weitzel

181 TAS
Lt. Col. Reginald A. Pinson
CMSgt. Bobby D. Taylor

5,000

2 AES
CMSgt. John R. Higuera

6 MAS
SSgt. Jackie Lawrence

7 SOS
MSgt. Harvey B. Long
SSgt. James D. Avant

9 SOS
Capt. Ronald J. Robbins
Capt. David A. Bores

41 TAS
SMSgt. John T. Ball, Jr.
MSgt. John E. Campbell
TSgt. William E. Watson

75 MAS
Lt. Col. Eric T. Emerson
Lt. Col. Dennis W. Kesling
Lt. Col. John F. Osborn
Lt. Col. John E. Welles
TSgt. Robert G. Nance
SSgt. John T. Werner

133 TAW
Lt. Col. Gary D. Hitzeman

153 TAG
Col. Jimmie L. Winders

165 TAG
Lt. Col. Etsel W. Altman
Lt. Col. Sidney R. Toler
Lt. Col. Steven Westgate
Maj. John H. Brunson
MSgt. Gary F. Bond
TSgt. Roy W. Underwood

181 TAS
Col. Winston Williams
Lt. Col. Larry L. Landtroop
MSgt. Thomas A. Scott

701 MAS
SMSgt. Lewis W. Blackwell
MSgt. Duane H. Delk
MSgt. Francis L. Dugas
MSgt. James A. Edwards
MSgt. Edward W. Goble
MSgt. Larry N. Oliver
MSgt. Harry C. Osborne, Jr.

702 MAS
Maj. Thomas R. Liebermann
MSgt. Roelof Blok

Det 3, 1403 MAS
Lt. Col. Glen S. Haden/CC

1401 MAS
Lt. Col. Timothy E. Shafer

1467 FCS
MSgt. Larry E. Kiracofe

2,500

1 AES
SMSgt. Colon T. Jones
TSgt. Margaret H. Coates
SSgt. Robert M. Hodges

1 SOS
Maj. David A. Reinholz
Capt. David Erteschik
MSgt. John A. Clark
SSgt. James E. Walker, Jr.

7 SOS
Capt. David J. Barragy
Capt. Glenn W. Barron
Capt. Stephen M. Batts
Capt. Joseph L. Divito
Capt. Harold L. Fenner
Capt. John M. Garrisi
Capt. Curtis R. Reynolds
Capt. Stephen P. Weiler
MSgt. Harvey B. Long
MSgt. Larry W. Osteen
TSgt. Bradford R. Warsop
SSgt. Bradly S. Lalim
SSgt. David H. R. Metherell

9 SOS
Lt. Col. Arthur A. Jistel
Lt. Col. Enrique A. Oti, II.
Maj. Randall M. Hill
Maj. Joe E. Tyner
Maj. Michael V. Walsh
Capt. Michael H. Cohen
SMSgt. Richard E. Dwornik
SMSgt. William H. Rogers
MSgt. Gregory A. Bailey
MSgt. Larry W. Beaver
MSgt. Joe A. Black
MSgt. Don C. Ford
MSgt. Charles V. Longshore
MSgt. Haldor C. Regi
TSgt. Robert J. Andrus, Jr.
TSgt. Herbert K. Black
TSgt. Richard M. Duncan
TSgt. Raymond W. Gouthro
TSgt. Stephen S. Graham
TSgt. Mathew D. King
TSgt. Randell L. Lake
TSgt. Arthur J. Millard
TSgt. Robert L. Russell
TSgt. Lewis D. Waters
SSgt. Bruce E. Carver
SSgt. Douglas J. Leach
SSgt. James D. Mathews, III.

11 AAS
Capt. Daniel L. Rooney

75 MAS
Lt. Col. Richard S. Hefner/CC

57 MAS
Maj. James L. Urion
Capt. Mondell R. Anderson
Capt. Herbert C. Bailey
Capt. David L. Chesworth
Capt. Robert H. Culver, Jr.
Capt. Donald P. Goforth
Capt. Johnny D. Johnson
Capt. Michael W. Menz
Capt. Eric W. Thompson
Capt. Keith R. Turner
TSgt. Mario R. Almendarez
TSgt. Vernna L. Moore, Jr.
TSgt. Dennis K. Raffield
TSgt. Billy G. Roy
SSgt. John E. Pabst

153 TAG
Lt. Col. Duane F. Mrosla
Lt. Col. Miles B. Scribner
Lt. Col. Jon A. Sims
Lt. Col. William D. Whittaker
Maj. John F. Bone
Maj. Robert R. Carlson
Maj. Bruce N. Correll
Maj. Jeffery S. Connolly
Maj. Donald A. Eldhart
Maj. Reginald M. Fowler
Maj. Leonard C. Kearl, Jr.
Maj. James R. McGrath
Maj. Michael G. Montgomery
Maj. Richard W. Morrison
Maj. James V. Nelson
Maj. Alan J. Ose
Maj. Ernest A. Pinson, Jr.
Maj. Harold E. Reed
Maj. Larry S. Rodekohr
Maj. Robert D. Rodekohr
Maj. Robert A. Schmidt
Maj. Roy M. Thompson
Maj. Howard G. Wisseman
Capt. William P. Curran, II.
Capt. Wells T. Jackson
Capt. John D. Lebeau
MSgt. Dennis R. Davis
MSgt. Wayne A. Mahan
TSgt. David E. Crerar
TSgt. Robert C. Kolbo
TSgt. John T. Limon
TSgt. Roger A. Woolington
SSgt. Scott A. O'Conner

165 TAG
Maj. Theron R. Allmond
Maj. Richard Armstrong
Maj. Eugene D. Ashley
Maj. Jefferson M. Bailey
TSgt. Gregory L. Bell
TSgt. Richard A. Bell

181 TAS
Lt. Col. Larry E. Raney
Maj. Felix P. Alcantara
Maj. Robert B. Douglas
Maj. Mike W. Doyle
Maj. Frederick C. Ganske
Maj. Ronald A. Hale
Maj. Rodd King
Maj. John J. Quesenberry
Maj. David J. Stonehouse
Maj. Harvey A. Weisblat
Capt. Charles M. Brininstool
Capt. James B. Dodd
Capt. Donald D. Harvel
Capt. David L. Roberts
Capt. James C. Robertson
SMSgt. Jerry A. Beasley
SMSgt. Johnny Jones
SMSgt. Theodore R. Williams
MSgt. Charles W. Edwards
MSgt. Vester R. Turner
TSgt. William D. Raby
TSgt. Timothy Savage

608 MAG
Col. Donald L. Buck
Col. Henry A. Salcido, Jr.
Lt. Col. Gregory C. Clark
Lt. Col. Eric B. House, II.
Lt. Col. George C. Hughes
Lt. Col. Thomas M. Schlesinger
Lt. Col. John J. Shinoskie
Lt. Col. James R. Shirley
Maj. Sherman Bedford
Maj. John L. Carkeet
Maj. Jack R. Exon
Maj. Rickey R. Gholson
Maj. Joseph D. Goodell
Maj. Andrew B. Haines
Maj. Norman A. Hannah, Jr.
Maj. David C. Holmes
Maj. Thomas L. Jackson
Maj. Kenneth W. Nord
Maj. Brian H. Peckham
Maj. Bernie Sanders
Maj. Troy L. Sanders
Maj. Roy E. Smith
Maj. Daniel Westmoreland
Capt. Kevin J. Clements
Capt. Michael J. Clemons
Capt. Douglas S. Crouch
Capt. Kenneth Davis
Capt. Robert Freaney, Jr.
Capt. Celeste Hayes
Capt. Charles F. Hobbs
Capt. Charles J. Holubik
Capt. Brian J. Larson
Capt. George J. Mack
Capt. James E. Manley
Capt. Randy J. McCoy
Capt. Stephen L. Roodhouse
Capt. Michael H. Tennerman
Capt. Glen R. Wagner
CMSgt. Edward B. Drew, III.
SMSgt. Milburn R. Klindt
SMSgt. Henry M. Klinkert
MSgt. John R. Hart
MSgt. Sterling D. Koch
MSgt. Marcie M. Mutum
TSgt. Charles Ahrens
TSgt. Thomas Blair
TSgt. William E. Cadola, Jr.
TSgt. Michael S. Pohl
TSgt. Grady W. Steen
TSgt. Brian K. Wentworth
TSgt. Brenda D. Williams
SSgt. David W. Glaab
SSgt. Nathan H. Koide

701 MAS
CMSgt. Eugene H. McDonald
SMSgt. Robert S. Brock
MSgt. Wilson C. Cook, Jr.
Sgt. Harold E. Dasinger
MSgt. Roy L. Holston
MSgt. Frank S. Hood
MSgt. Robert W. Jameson
MSgt. Nathan A. Kimble
MSgt. Leonard A. LaBranche
MSgt. Kenneth J. Mills
MSgt. Tommy J. Peters, Jr.
MSgt. Carmelo Roman-Quinones
MSgt. Flemind D. Smith
MSgt. Frank A. Steele
MSgt. Robert E. Tipton
TSgt. William L. Alison, Jr.
TSgt. Carl S. Padgett
TSgt. Candace L. Taylor
TSgt. George T. Woodruff, Sr.
SSgt. Vance A. Bentley

702 MAS
Maj. Lawrence L. Etzel
Maj. Thomas W. Simm
Capt. Lawrence E. Rehr
MSgt. John W. Voscavage

1401 MAS
Lt. Col. Robert R. McCarty
Lt. Col. Robert E. Dorough
Lt. Col. Michael H. Leiker
Maj. Charles N. Mullin

1,000

608 MAG
Capt. Kelly E. Andersen
Capt. Theodore Hartenstein
Capt. Kerry W. Taylor
Capt. Steven J. Walker

Ranks and units are those at time of award. ★

QUICKSTOPPERS

ADULT SUPERVISION

(March 1988)

A Navy C-9 recently suffered a soaking experience with 40 Sea Scouts aboard. Seems one of the scouts forced the water faucet past the point of no return and left the water running with the drain closed. Well, as can be expected, almost 15 gallons of water flooded the lavatory before a crewmember discovered it.

The quick-thinking AC requested an immediate descent below the freezing level. Water soaked the baggage compartment, and the mission was cancelled until a full inspection could be performed.

While no one was hurt, the potential existed to freeze flight controls, short-circuit electronics, and any number of other "undesirable consequences."

ACE OF ACES

(August 1975)

In aviation, an ace is a pilot who shoots down five enemy aircraft. In golf, an ace is a hole-in-one. But what do you call a golfer who shoots down an airplane in one shot? This actually happened. A single-engine airplane doing low-level mosquito spraying was struck by a hard hit golf ball that passed through the whirling propeller. The ball smashed the windscreen, bounced off the pilot's helmet, and shattered a side window. Although stunned by the impact and injured by flying glass, the pilot kept control of his aircraft and made an emergency landing at a nearby airstrip. In answer to the question, the pilot had his own name for the golfer.

FROM THE LIMERICK PEN OF ERIC V.

(December 1968)

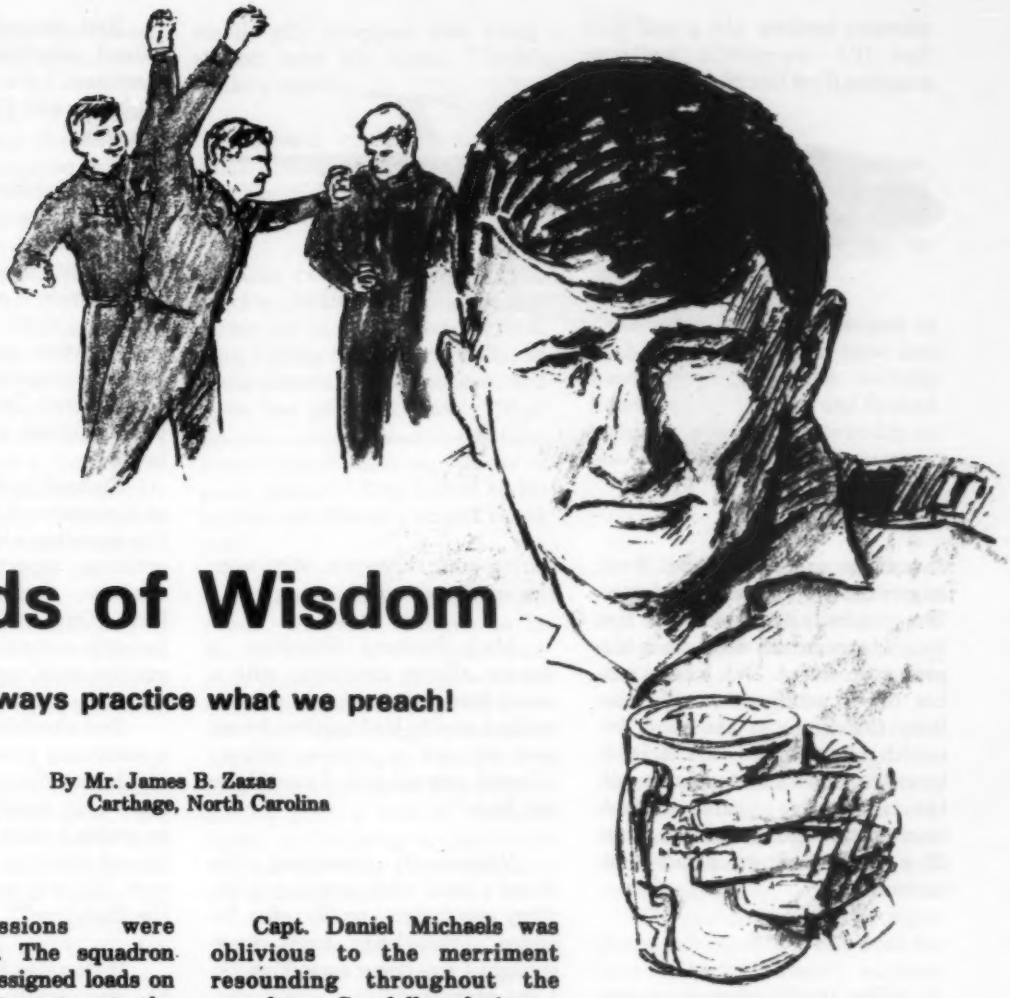
There once was a Nav named Hope
Who never looked at his scope,
'Till one day a great storm
Bent his craft out of form
Poor dope . . . no scope . . . no Hope!

FROM THE LIMERICK PEN OF ERIC V.

(November 1968)

There once was a pilot named Ted
Who viewed his checklists with dread,
He'd just kick the tires
And then light the fires,
Now he's down-graded to dead!

HERE LIES HOT-SHOT-TED
FLYING ACE SO QUICKLY DEAD
HIS CHECKLIST NOT RUN
FOR AN ENGINE "UN-DONE"
HE FOUND A PERMANENT BED
R.I.P.



Words of Wisdom

We don't always practice what we preach!

By Mr. James B. Zazas
Carthage, North Carolina

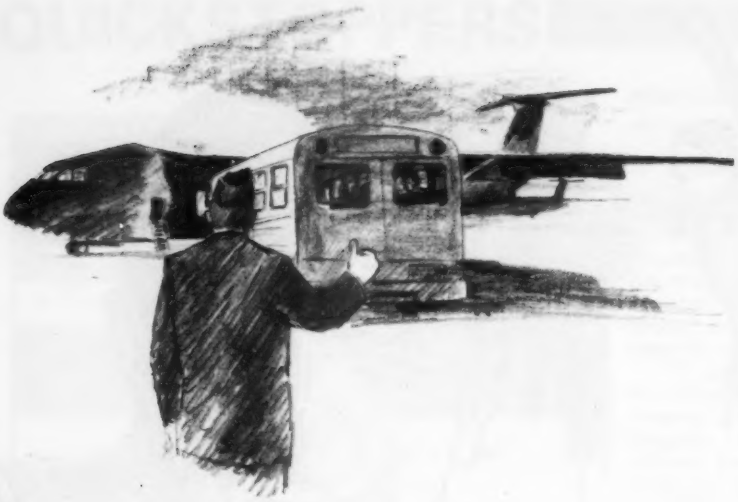
The missions were successful. The squadron had placed all assigned loads on the assigned targets at the assigned time. Even before the wheels of the last returning transports touched the earth, the "higher-ups" were praising the unit for a job well done.

The squadron was alive with merriment. The flightcrews celebrated their proud accomplishments. Many toasted to squadron buddies, some toasted to their overall good fortune during the exercise.

Capt. Daniel Michaels was oblivious to the merriment resounding throughout the squadron. Carefully placing a telephone back on its cradle, he picked up a tall, lead crystal mug from his desk. Alone in his office, he handled the polished glass as if it were his most prized possession. For the moment at least, it was.

A tear came to Captain Michael's eye. Not until it rolled down his cheek did this young flyer acknowledge the meaning of this mug. Given as a gift, it represented the values of a close

1988 MAC Flight Safety Writing Contest Special Category



friendship now broken, not from anger, but from a needless death. The prophetic inscriptions on the mug's transparent sides made the pain even worse. Dan looked out his office window towards the busy flightline. In his mind, he could almost see his friend bounding down the steps of one of the nearby camouflaged transports, smiling with the pride of a mission flown safely and successfully.

****

"Hey, Daniel, where have you been? I've been looking all over for you!"

Dan Michaels looked up, searching for a face to match the voice that called his name. He smiled as he recognized his best friend and former squadron mate from a time that seemed so long ago. Dan rose from his desk to greet the smiling face coming his way.

"Richard Sheridan, how in the world are you? Long time no see, and other such trivialities. I see you picked up more than a tan during your three-year stint near the sand and surf."

Maj. Richard Sheridan, a stocky, affable individual with a round face and piercing blue eyes, walked over to his longtime friend and let out a joyous bellow, "Daniel, you old salt. I'm still the old Rich."

Vigorously pumping his friend's hand, while pointing to the shiny new insignia on his collar, he added, "Somebody must have thought I was doing a good job. So I got promoted."

For Daniel, the laughter was infectious and he shared in the merriment of the reunion too. But his brown eyes narrowed as he scrutinized his recently promoted friend's face closely.

"What's with the surprise visit, my fellow friend-of-the-air? My humble office not sending your boys at numbered air force enough paperwork? And what kind of good job warranted this promotion? The last letter I got from you said you were involved in some flight safety program."

Rich let out another bellow. "Good questions, Daniel, good questions. Let's take a walk to the flightline and I'll *show* you your answers."

The flightline was a beehive of activity. People and trucks scurried about, preparing aircraft for missions while others attended to the needs of returning aircraft. The noisy shrill of turbine engines was constant, as was the smell of burned kerosene permeating the air. For both Daniel and Richard, this flightline was like a second home.

Richard spoke first. "Daniel, as I mentioned in my last letter, I'm spending a lot of time reading accident reports, investigating mishaps, their causes, and so forth. Once all this material is properly understood, it's my job to get the word out."

Dan chuckled while casting a questioning glance at his buddy. He knew Richard was a very observant, intelligent officer. But he couldn't quite grasp his friend's line of thinking. "All you say is true, but why are we out here on the flightline?"

If Dan was bewildered before, he was really confused now. However, in a dedicated effort to satisfy his best friend's query, he made an attempt to look at the smaller picture.

"Well, Rich, I see an airman placing chocks around the wheels of a truck. I see a pilot placing some junk in a FOD container. I see, also, an aircraft commander giving a stern lecture to a young loadmaster, most likely concerning the propeller he is pointing out to the young lad."

Dan stammered, "But, Rich, what am I . . . . ?"

Rich interrupted his friend. "Think, Daniel. What do you see?"

Dan continued, "I see men and machines doing the job they were trained or designed to do. I see professional efforts to keep machines intact and men alive."

Rich smiled broadly. "Right on the money, Dan. That airman is chocking his truck to prevent it from inadvertently rolling over someone or into something. The FOD cans are depositories in which to place junk or trash that could give a vehicle a flat tire, or cause a fifty-million dollar aircraft to crash. And that loadmaster should have known that you don't walk through the prop arc."

Rich's blue eyes narrowed as he asked his buddy, "With all these fine examples, and countless more around you, what ties them all together?"

Dan rubbed his chin, his mind searching for more answers. Then it hit him and his brown eyes opened wide in the revelation. "People . . . people willing, no, *wanting* to do their job safely—an ATTITUDE to do their job safely."

Rich beamed, "Exactly, Dan, exactly. Attitude is the key to flight safety. God knows, I've talked myself blue preaching flight safety but until an individual, a squadron, or a wing as a whole develops a positive, receptive attitude towards flight safety, my voice is nothing but hot air."

Dan nodded his head in agreement. His mind flooded with reasons people get hurt or killed because of a poor attitude towards flight safety and overall safety, in general. However, his brief daydreaming was cut short by a small, gift wrapped box being thrust into his hand, "Huh? What's this?"

Richard smiled again. "A small present, my friend. I hope you like it. You and I think a lot alike."

Dan removed the wrapping quickly. Nestled on a cotton bed inside the box was a lead crystal mug. Lifting the glass carefully, he could discern an inscription etched upon the polished glass. *"Flight safety is an attitude, learned from training, fostered through experience, enhanced by proper judgment."* Dan looked at his buddy and offered a sincere thank you.

"You're most welcome, my friend. However, I have to be honest with you; I've got a hundred plastic coffee mugs with the same inscription tucked away on the '141 that brought me here. Numbered air force wants me to look into why one of our units is having such a rash of mishaps lately, so I'm going to play Santa Claus a bit while I'm conducting my investigation."

Dan threw an admiring glance at his friend. "You old dog," he said. "You have always figured new and unique ways to get the flight safety word out, from writing stories for *The MAC Flyer*, to the 'Fly Safe' swizzle sticks you graciously supplied our wing commander's New Year's party." He chuckled and added, "No wonder you were promoted."

Rich laughed also. "Well, like I said, somebody must have thought I was doing a good job. Anyway . . . " Rich glanced at his watch. "Hey, I've got to run and catch that '141 out of here. Santa Claus mustn't be late. And if I'm not mistaken, your squeaky-clean unit has a big airdrop exercise starting tomorrow. I'll call Saturday night and we'll compare notes. Okay?"

"Okay, Rich. We'll do that. Congrats on your promotion." Looking at the mug once again, Dan added, "And thank you for your words of wisdom."

Farewells were exchanged as Rich hopped aboard a crew bus heading towards the waiting Starlifter. Rich smiled and flashed a big "thumbs up" to his buddy as the bus drove across the ramp.

****

The missions were successful as all loads were dropped on time and on target. The entire unit executed their duties safely and professionally. The crews celebrated with gusto.

However, Captain Daniel Michaels was oblivious to the merriment around him. Sitting alone in his flight safety office, he carefully held an inscribed, lead crystal glass in his hands, and remembered.

The promised Saturday night phone call came, but not from his best friend. Instead, another friend in another flight safety office called to say Richard Sheridan was gone. The 4-engine transport carrying him had gone down while trying to fly a below-minimums approach.

Daniel Michaels grieved silently. It was painfully obvious that someone on the ill-fated Starlifter's crew neither valued his mug nor heeded its words of wisdom. ✯

Mr. Zezza, a faithful contributor (and winner) in the *TMF* Writing Contest, is a Boeing 727 First Officer with Piedmont Airlines.

LOW LEVEL AND BIG AIRCRAFT

You have to ask yourself—"Do I feel lucky today?"

By Joseph F. Tilson
Directorate of Aerospace Safety
Air Force Inspection and Safety Center

(Editor's Comments: The following article was written by Mr. Joseph Tilson in response to a request from MAC's Director of Safety. As you'll see, Mr. Tilson wisely applied the principles discussed to all large Air Force aircraft. Originally printed in *Flying Safety* magazine, we hope you'll read and heed. The life you save . . .)

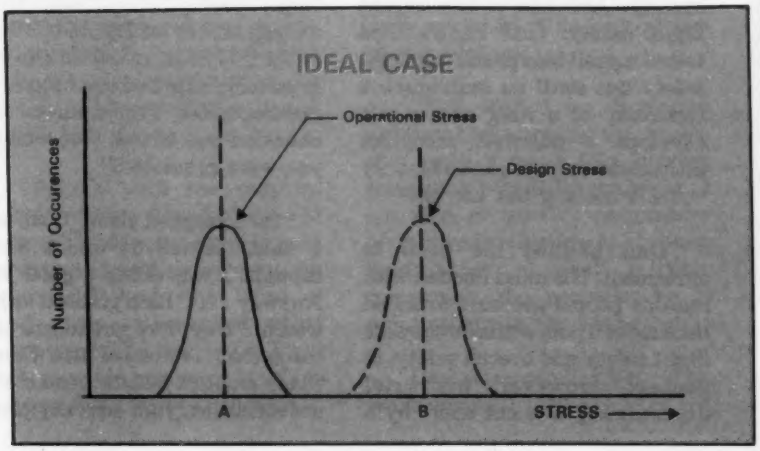
Today, we find a need to operate our large (C-130, C-141, C-5, KC-135, and B-52) aircraft on mission profiles not considered during their original structural design. It's becoming very important that operators of these aircraft understand what these differences mean in terms of safety, and what they can do to reduce the increased risk attendant with these new missions.

A False Sense of Security

We've been operating aircraft, such as the C-130, down in the nap-of-the-earth for so long we've begun to think it has some special design qualities allowing us to yank and bank in almost any manner we choose and "that ole baby will hang in there." Many of us tend to think in terms of aircraft age, rather than design capability. We point to the B-52 and remark how such an old aircraft can handle this severe use. We take a C-130 to Red Flag and are greatly impressed by its performance. This line of thinking needs a little broader perspective, lest we step over the line and experience a structural catastrophe.

B-52s flying today bear little structural resemblance to those which rolled off the original production line 25 years ago. Almost all load-carrying structure has been replaced or reinforced as the result of several aircraft losses which occurred when we brought the aircraft down into the low-level environment. The B-52 System Program Manager at

Figure 1



Oklahoma City expended several hundred million dollars to make the aircraft safe for these new missions. The Air Force film "Flight Without a Fin" will water your eyes even as it explains only one small portion of the problem.

The C-130 has frequently been maneuvered down in the weeds at, and probably beyond, its handbook limits. This tends to cultivate a false sense of security about the risks of the operation. New missions emphasizing weapons avoidance tend to mask other serious threats, such as local turbulence or asymmetric maneuvering. Contrary to popular belief, none of these aircraft were designed with any special maneuvering load capability beyond that of a garden variety commercial airliner.

Key Design Elements

Gust is a key element in large aircraft design. The structural designer assumes the aircraft will occasionally encounter a vertical gust of 55 ft per second (32 kts). He assumes certain gross weights and maneuvering loads, and arrives at a decision about strength requirements. This is called the *design limit load* (DLL). Pilots can relate this to the *maximum allowable "G"* (load factor) specified in the operator's handbook.

The designer is aware that there are a great many variables in manufacture, maintenance, and each aircraft's operation. To assure the pilot can depend upon the handbook allowables, the designer adds 50 percent load to the DLL and arrives at a load called *ultimate load*. While this is a theoretical strength beyond which the structure is expected to catastrophically fail, it's *not* a guaranteed capability for every aircraft.

There are a great many operators who erroneously think the structure is 50 percent stronger than the handbook-allowable load factors. Yes, the designer did add a 50 percent margin for ultimate strength, but that was done for a great many reasons, *none* of which were to accommodate an over-aggressive operator.

That Extra 50 Percent

Let's discuss some of the reasons for that extra 50 percent and why it may not be there for you to trade upon. Figure 1 depicts two normal distribution curves around points A and B. Point A is the maximum allowable handbook load factor. We know that some pilots will occasionally exceed this value, so instead of all maneuvering loads going right up to the A value and stopping, we see some actually going over onto the over-G side.

However, knowing this and many other things were going to happen, the designer engineered it to a strength at point B (ultimate strength). Since all aircraft may not actually be built (due to manufacturing variances) to the design ultimate strength, we see a normal distribution curve about point B. Ultimate strength is a *theoretical* number, not a guaranteed value.

Figure 2 depicts those same two curves in the real world. Note that both curves have shifted toward each other. The curve that was at point A has moved

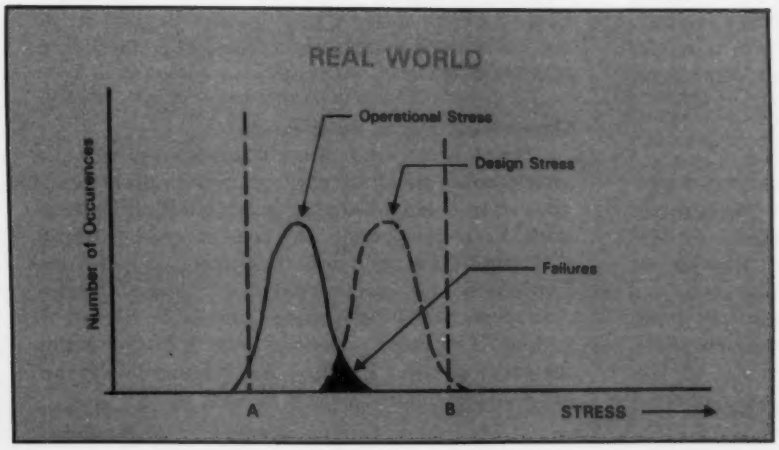


Figure 2

right, indicating the operators are imposing more load than approved in the pilot's handbook. This occurs when the aircraft is operated over-aggressively or experiences turbulence while maneuvering in a heavyweight configuration. The curve that was originally at point B has moved left. This movement can be caused by several things, many of which are beyond reasonable control.

The main reasons this curve shifts left are:

—*Repeated overstressing*, loosening fasteners.

—*Defective drilling* during manufacture, causing severe stress concentration.

—*Corrosion*, causing severe stress concentrations and crack initiation.

—*Structural damage* induced by maintenance or the flight crew.

—*Improper repairs* performed at field and depot level.

—*Defective material* properties in original or subsequent manufacturing.

—*Optimistic design assumptions* regarding actual unsafe loads environment.

Note that Figure 2 shows a shaded area where the two curves overlap. This means those aircraft short on design strength are being subjected to greater-than-allowed flight loads and are destined to fail. The system manager spends hundreds of millions of dollars trying to keep the design stress curve at point B, but if you study the preceding list of reasons for its movement, you'll see many of these things are out of the manager's hands. The other way to reduce failures is to educate operators so they don't move the operational curve right of point A.

Your Questions

Let's address the following questions which invariably arise during discussions of this subject.

Q—I know a guy who exceeded the handbook maneuvering limits; an over-G inspection showed no damage. Why?

A——The aircraft was probably at a very light gross weight at the time and, if not, it was probably free of structural defects. Very likely it came off the production line as one of the aircraft actually built with point B (or better) strength.

Q—Don't they test the aircraft during initial design to prove it has the full 150 percent ultimate strength?

A——Yes, they do, but they test only one aircraft and are satisfied if it's at (or near) the 150 percent point. Normal rules of probability say some aircraft will actually be built with strength below 150 percent. However, if you were the contractor, wouldn't you do everything in your power to assure that the test aircraft was flawless?

Q—Then why don't we provide a bigger structural margin such as 160 percent or 170 percent?

A——Extra strength adds enormous weight to the aircraft. If the user operates the aircraft as originally agreed upon (point A), then 150 percent is adequate. Extra weight also reduces range and performance. Any structural engineer who designs this way finds his or her career detoured into designing things that don't fly, such as plastic models or highway bridges.

Q—Well, what do we do now that we have these new missions not in the original planning?

A—Assist the system program managers in identifying new missions and support their needs to measure loads, design modifications, and fund new work to help the aircraft meet new operational requirements. Above all, know your operational limits and fly "smart" until program managers can get your aircraft modified. Remember, the day you're trying to be at the top of the class in threat avoidance, you may be flying an aircraft at the bottom of the class in structural strength.

Keep in mind there's something else out there that wants a part of your operating curve, and you don't get a vote on its right to share. That's the unseen vertical gust, appearing in the form of turbulence. If you're using full aircraft capability and encounter a vertical gust in excess of the rather modest 55 ft per second (32 kts) assumed by the designer (who wasn't told about your nap-of-the-earth flying), you'd better hope your aircraft isn't at the bottom of the class. A gust greater than 55 ft per second is much more likely to occur at 3,000 ft than at 20,000 feet.

Operational Flight Restrictions

Some of today's aircraft are known to have questionable structure and are appropriately being allowed to operate only under certain flight restrictions. These restrictions have been imposed to assure safe aircraft operation until the suspect structure can be properly inspected, modified, or replaced. A wise user respects the restrictions imposed on his or her aircraft. If we keep the curve at point A from crossing the curve at point B, you'll arrive home safely and get another chance to do it all over again. ✈

Reprint from *Flying Safety*

TMF INSTRUMENT QUIZ

Just another island paradise?

1. What navigational aids are required to execute the ILS RWY 6R?

   a. Localizer and glideslope.
   b. Localizer, glideslope, and approach radar.
   c. Localizer, glideslope, and TACAN.
   d. b or c above.

2. Minimum safe altitude for the missed approach is _____ .

   a. 2,400 ft
   b. 2,300 ft
   c. 1,900 ft
   d. not specified

3. Emergency safe altitude is _____ .

   a. 2,700 ft
   b. 2,400 ft
   c. 2,300 ft
   d. 1,900 ft

4. You are inbound to LUMMS heading 220 degrees, holding pattern entry would be to turn outbound in the shortest direction to parallel the holding course.

   a. True.
   b. False.

5. You are established in the arrival holding pattern, outbound, when approach issues clearance for the ILS RWY 6R. You may extend beyond 17 DME for maneuvering airspace once cleared for the approach.

   a. True.
   b. False.

6. Where does the DME signal identifying ANIKA originate, and is it required to execute the S-ILS 6R?

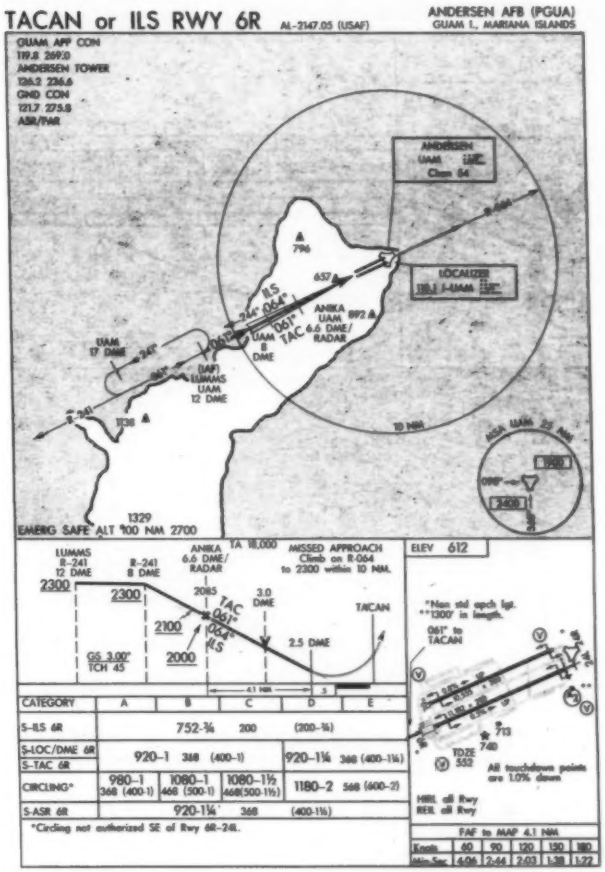
   a. UAM, yes.
   b. UAM, no.
   c. I-UAM, yes.
   d. I-UAM, no.

7. The 1,138-ft tower, south of the holding pattern, is the highest obstruction shown.

   a. True.
   b. False.

8. Let's assume the TACAN is NOTAMed out of service. (Uh oh, here it comes!) You're 23 miles northeast following a radar vector heading of 240 degrees, advised to expect straight-in ILS, landing Runway 6. Guam suffers an island-wide power failure. You are lost comm! There's still a good ident on the localizer, emergency backup power has gone to work there, but a minute has gone by and no word from Guam Approach or Andersen Tower, yet there're a lot of airplanes talking to each other on Guard. May you continue with your cleared for, and planned, execution of the straight-in ILS, Runway 6?

   a. Yes. You are automatically cleared to fly any approach.
   b. Yes. However, you'll have to hold at LUMMS if you're ahead of EAC or EFC time.
   c. No. Hold at present position until radio communications are restored.
   d. None of the above.



VOR, ILS, and NDB approaches. This scenario definitely is a textbook example of why you should coordinate a compatible backup approach with the controller prior to accepting radar vectors to an approach you absolutely needed radar vectors to. So what's the right answer? There isn't, we gave you some wrong answers and some possible, workable solutions; if something this strange ever happens, I hope you'll do the right thing. Situational awareness and prior planning are the keys.

AFM 61-37, para 10-1b.

9. d. UAM 241/6.6 or radar.

10. b. Once you receive approach clearance, maintain the last assigned altitude and heading until established on a segment of a published routing or IAP. From that point, comply with all course and altitude restrictions as depicted on the approach procedure. Exception: you must not climb above the last assigned altitude to comply with published altitude restrictions unless so instructed by the controlling agency.

AFM 61-37, para 10-8b.

11. c. A mandatory radio call is required when departing altitude when cleared for approach, radar environment or not.

Flight Information Handbook, para 1d(a), page 6-6.

12. b. False. Clearance for the approach does not include clearance for the holding airspace. If your heading is within 90° of the procedural course, you may use normal lead points to intercept the course.

AFM 61-37, para 10-6f.

13. d. AFM 61-37, para 12-9a.

14. a. If cleared for the approach while holding in a published holding pattern (in lieu of procedure turn), and the aircraft is at an altitude from which the approach can be safely executed, additional circuits of the holding pattern are neither necessary nor expected by ATC.

AFM 61-37, para 12-3f.

15. b. False. 2,100 is the glideslope intercept altitude. Technically speaking, there is no defined point in space representing an FAF for an ILS approach. When glideslope is intercepted—you start down. The lightly printed 2,085 number represents the glideslope altitude at ANIKA.

16. b. False. A VDP applies only to nonprecision straight-in approaches. It is normally identified by DME and is computed for the nonprecision approach with the lowest MDA on the IAP. A 75 MHz marker may be used where DME cannot be implemented. VDPs are not a mandatory part of the procedure, but are intended to provide additional guidance where they are implemented. To be assured of proper obstacle clearance, the pilot should not descend below MDA before reaching the VDP and acquiring the necessary visual reference with the runway environment.

AFM 61-37, para 7-6b(6).

17. c. The total runway gradient is, in fact, 0.5%; so what's with the "all touchdown points are 1.0% down" remark in the airport sketch? If you've ever been to Anderson, you know the answer. Anderson's runways are like a roller-coaster, similar to the flying business itself, they have their ups and downs. In fact, when you take off from Runway 6 you start downhill, and somewhere about mid-field you begin climbing uphill. Those stationed there constantly discuss the possibility that, without adequate climb angle, you could actually lift off and run into the runway at the opposite end. Point is, notice those freaky little contradictory remarks wherever you spot them on an IAP. It's all useful planning information.

9. When inbound on the localizer centerline, ANIKA can be identified by _____.

a. UAM 241/12
b. UAM 241/6.6
c. approach control radar
d. b and c

10. You are following radar vectors to LUMMS steering 090 degrees at 2,500 ft MSL. Approach control issues clearance for the ILS RWY 6R. At what point may you descend to 2,300 ft?

a. Immediately.
b. After reaching LUMMS, whether course alignment maneuvering is required or not.
c. If course alignment maneuvering is required, only when crossing LUMMS inbound on the approach.
d. a and c, depending on maneuvering requirements.

11. In the circumstances of Question 10, is a radio call required when beginning descent?

a. No. Approach clearance has been issued.
b. No. We're in a Radar Environment.
c. Yes.
d. a and b.

12. You are inbound to LUMMS, heading 030 degrees at 2,300 feet. Approach has issued clearance for the ILS, you may either use normal lead points to intercept the inbound course, or use a circuit in the arrival holding pattern for better course alignment.

a. True.
b. False.

13. (Here's one of those "compound" answer questions. Don't you *hate* those!) The holding pattern (in lieu of procedure turn) will not be flown in the following instances:

I. When issued an ATC clearance for a "straight-in" approach.
II. When the initial approach is via a NoPT course.
III. When ATC vectors the aircraft to final approach course.

a. I and II.
b. I and III.
c. II and III.
d. I, II, and III.

14. You have been in the arrival holding pattern, at 2,300 ft, awaiting approach clearance. Present position is course-064 degrees, 14 DME and approach clears you for the ILS RWY 6R. Without further clearance for the holding pattern airspace, you MUST commence the approach.

a. True.
b. False.

15. 2,100 ft is a mandatory altitude when crossing ANIKA inbound on the S-ILS RWY 6R.

a. True.
b. False.

16. The VDP (Visual Descent Point) is a defined point on the final approach course of any straight-in approach procedure from which a normal descent, approximately 3 degrees, from that point to the runway touchdown point may be commenced, provided visual reference with the runway environment is established.

a. True.
b. False.

17. What is Runway 6R's total runway gradient?

a. 1.0% down.
b. 0.8% up.
c. 0.5% up.
d. None of the above.

1. d. Absolutely one of the first acts in planning an approach is determining compatibility with your aircraft's navigational equipment. Straight-in approaches are identified by the type of navigational aids providing final approach guidance and the runway to which the final approach course is aligned. This approach is no exception. To execute the final approach, glideslope intercept gate you started, decision height table you when to go "missed approach." Be aware that additional equipment may be required to execute other portions of the procedure. For example, the other "gotcha" on this approach plate is TACAN is required for the missed approach.
APM 51-37, para 7-6a.(3)(a).

2. c. MSA provides a minimum obstruction clearance of 1,000 ft above the highest obstacle within 25 nm from the designated facility. On this particular IAP, the MAP requires climb to 2,300 ft, yet the MSA is still 1,900.
APM 51-37, para 7-6b.(1)(3).

3. a. 2,700 ft.

4. Either a. or b. Now that's tacky! Well, yes it is, and we apologize for it, but we're making a point. Based upon strict APM 51-37 guidance, if you chose True, you're correct. But if you decided a teardrop would be conventionally aligned, and so answered False, you are also correct. This situation requires a judgment call. Granted, the manual offers, "as a guide," a definition of conventionally aligned as being within 45° of the selected teardrop course. We generally get into a fuss here because we tend to think that means applying 45° to the outbound course. In this case, 241° outbound, plus 45°, equals 286°. Minus your inbound heading of 230°, you've got a 56° turn. Obviously greater than the 45° the book warns you not to exceed. Now look again at the depicted arrival holding pattern. It's defined by DME, with a 5-mile inbound leg. At 170 KIAS, no wind, the leg takes 1+47 minutes to fly, indicative of the unusual nature of this particular holding pattern. In this case, a 45° intercept is too much. You could use it, but you don't need it. In fact, 30° would work fine here. That gives you a 41° right turn to your teardrop course, a safe maneuver. The point is this, teardrop entries are designed to make life easier, and I think they expedite inbound alignment faster than do parallel entries (my opinion, mind you). Study the concept thoroughly enough to avoid being locked into using only 45°, it's an option that expands your capability.
APM 51-37, para 9-6a(3).

5. b. False. When you're TACAN holding, start turns no later than the specified DME limits. If maneuvering airspace (other than an immediate turn at the IAF to intercept the procedural course) is desired, obtain clearance for maneuvering airspace.
APM 51-37, para 9-6b(3) and 10-6f.

6. b. Anderson TACAN originates the DME signal, but DME is not required if you use radar to fix ANIKA. TACAN bearing is required for the missed approach.

7. b. False. They've hidden a 1,329-ft spot elevation in the middle of the emergency safe altitude text, lower left corner, prolific view. Pretty sneaky, huh?

8. d. The first answer is partially correct, in fact if you experience lost comm, you are automatically cleared for any published approach. But in this case, with the TACAN out, you cannot "legally" navigate yourself to the IAF. That's not to say improvising wouldn't figure into this when it came down to life or death. Knowing you don't have a Pacific Volume I with you, I can tell you Anderson doesn't have a VOR approach. So much for that idea. Piling to Anderson, you probably would've listed Agana NAS. Guam, as one of your alternates. It's located about where the "D" of the word DME is at the 8 o'clock position of the 10 nm circle. Agana has

QUICKSTOPPERS

HERE'S A GRIPPER

(July 1973)

A short while back a pilot landed his C-9 at a Marine base and everyone on board enjoyed a wild ride. On touchdown the pilot in the jump seat noticed an individual on the runway approximately 2,000 feet from the aircraft. The pilot used max reverse and braking and steered for the side of the 150-foot wide runway. As the aircraft passed the pedestrian, the cockpit crew observered him diving away from the wingtip. They estimated that they missed him by about two feet.

The hazard report that followed bore these remarks from the airfield manager: "The individual was a snow plow operator working along side of the runway; he was crossing the runway on a 'call of nature' at the time of the incident."

We suspect that he accomplished just that when he saw the C-9 bearing down on him.

This incident reemphasizes the need to keep our heads out of the cockpit.

A HAIRY INCIDENT

(June 1975)

Just after the "pull chocks" signal was given, a young airman spotted fluid on the nose steering unit of a jet. The pilot was given a hold signal, and the airman headed for the nose steering unit to take a closer look. As the airman passed forward and below the left intake, the engine began vibrating and then stalled. It was immediately shut down and the crew deplaned.

What caused the engine malfunction may be a first in FOD history. The airman who had passed near the intake was a young female, and the foreign object that entered the engine was her wig.

YOU PICKED A FINE TIME TO LEAVE ME, LOOSE WHEEL

(September 1981)

The C-5 was coming in for a full stop after the long flight from Europe. Unfortunately, one of the wheels on the left forward bogie decided to get off early, screwed itself right off the axle, and promptly went AWOL. On its way into the 'boonies," the wayward wheel with attached tire was overtaken by the aft bogie which resulted in damage to, and subsequent deflation of, the other tires. (Very messy!) Another eventful ending to an otherwise uneventful flight!

An army of maintenance troops later combed the runway and surrounding grass and recovered the major conponents of the crumpled wheel. After a detailed examination, the experts surmised that the lock ring tabs were not properly seated in the axle slots and that a "back torque," directed by the tech order, wasn't accomplished during wheel installation.

CELEBRATING 35 YEARS OF *TMF*: 1954 - 1989

After Deadlines

HAVE YOU MISSED US???? It appears the Post Office's box-eating machine has been working overtime lately, resulting in several mutilated boxes of your favorite flight safety magazine returned to the *TMF* office. We don't do the actual shipping, but the return address on partially obliterated labels caused USPS to ship damaged boxes to us. If you haven't received your *TMF* allotment recently, call or write us and we'll try to mail you as many as we can. Our address and phone number are listed inside the front cover of this issue.

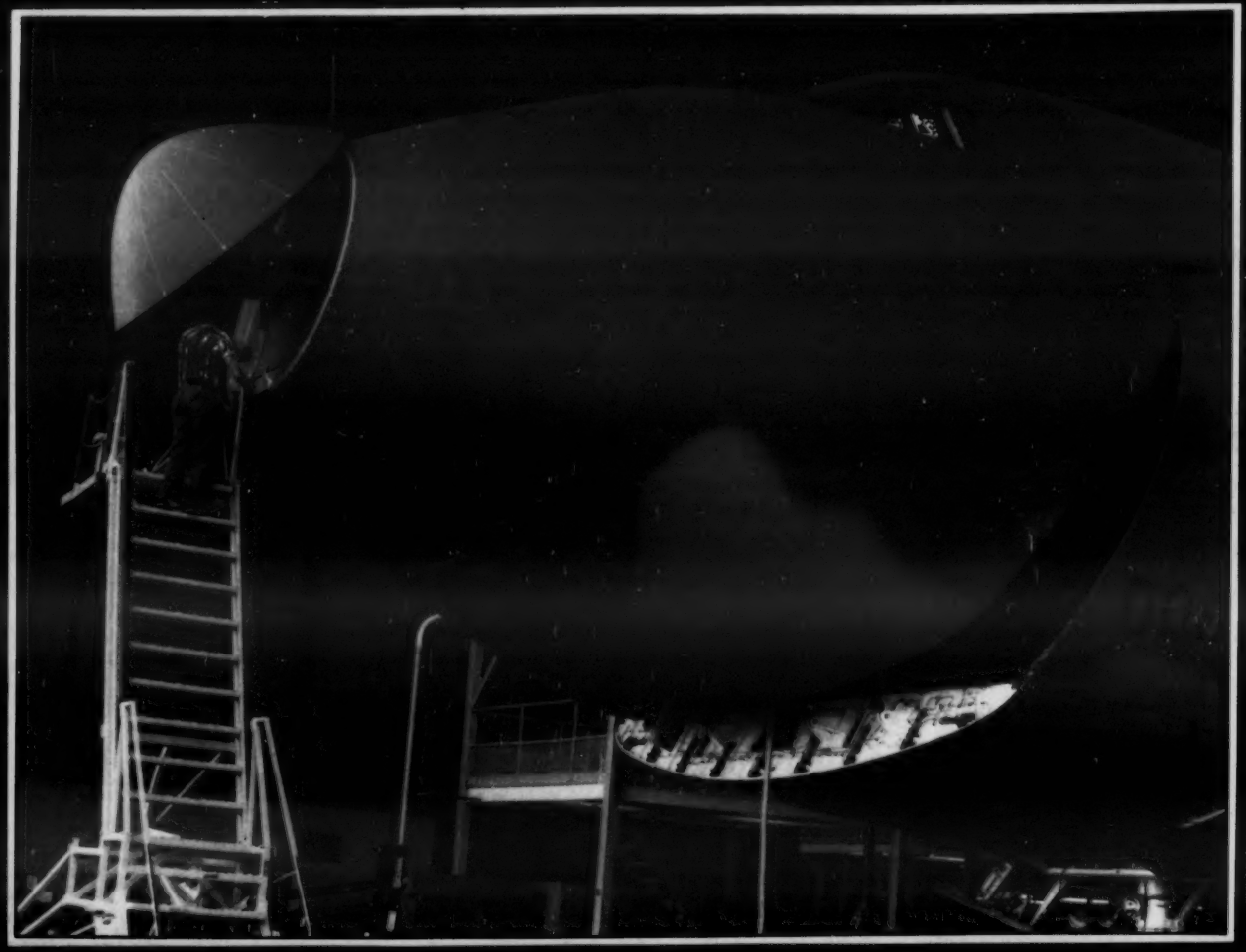
***LONG* FLYING AIRCREW** -- A North Carolina ANG C-130 crew recently flew what probably constitutes a world's record for the number of flying hours logged by a single aircrew. The combined flying time for the crew is 49,118.3 hours. The five crewmembers have a combined total of 126 years, 1 month and 17 days on flight status in the NC ANG. Most of them flew in the active Air Force, their flying hours are reflected in the total, their years of service are not. Can you top it?

The crew, left to right: SMSgt. Kenneth H. Roberts; Col. James A. Melvin III; Brig. Gen. Harold C. Earnhardt; Lt. Col. Paul A. Webb, Jr.; CMSgt. Billy F. Furr; and MSgt. David Dale.

WE'RE STILL LOOKING -- for a Rated Major for assignment to HQ MAC staff as an editor for *The MAC Flyer*, but the field is narrowing rapidly. Looking for creativity and desire to further flight safety goals by "spreading the word" through the favorite magazine of airlifters worldwide. For more information on this unique assignment, write to: Supervising Editor, HQ MAC/IGFE, Scott AFB, Illinois, 62225-5101, or call AV 576-3534/5542.

TOUCH N GO

Thanks to *LOCKHEED C-5 Galaxy Service Letter*.



" One more step up that ladder fella, and you're history. "